Can stream periphyton be used to indicate landscape disturbance on military lands?

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Why use periphyton?

- Small, easy to sample
- Short life cycles, quick response
- Sensitive to disturbance

Two algal habitats

Wood

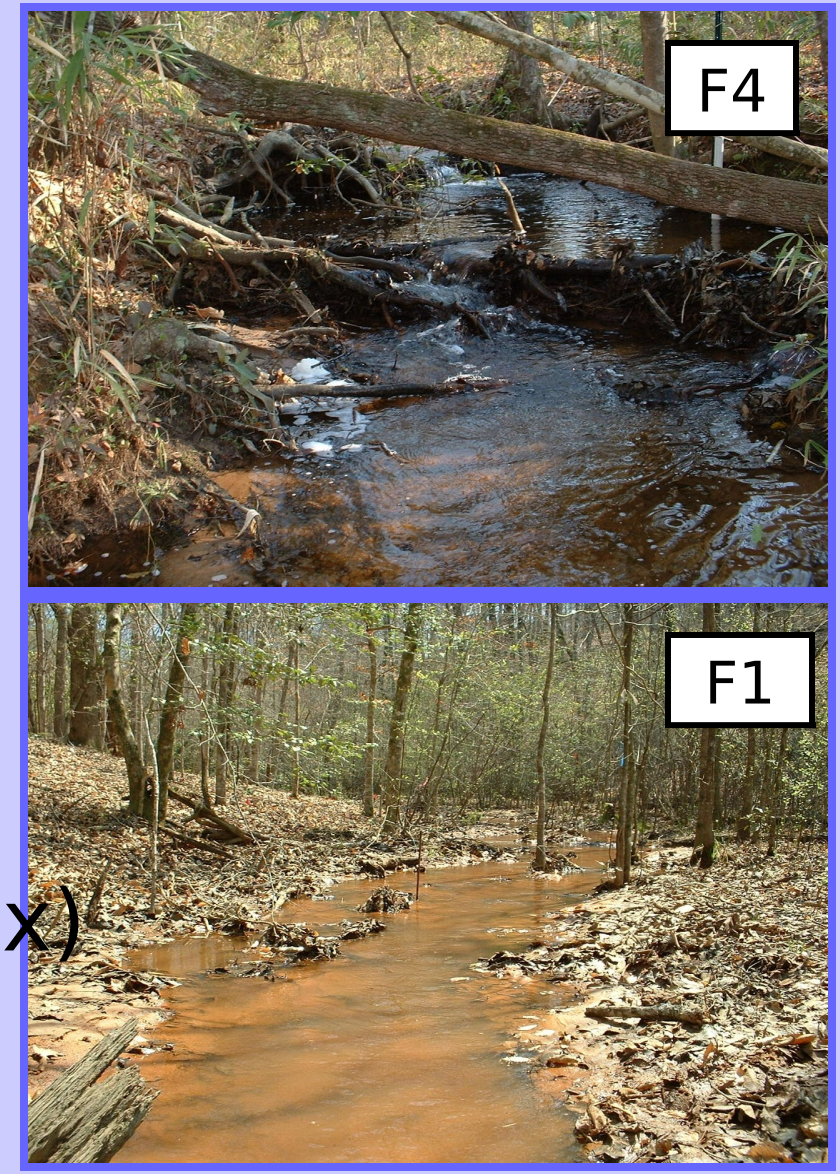
Sand

How could periphyton respond to sediment disturbance?

- Decreased algal biomass (chlorophyll *a*)
- Altered community (burial-tolerant)
- Altered microhabitat (sand, wood)
- Altered chemical environment (pH, nutrients)

Methods

- 10 study streams
- Gradient of disturbance based on % bare ground and roads in watershed (=disturbance index)

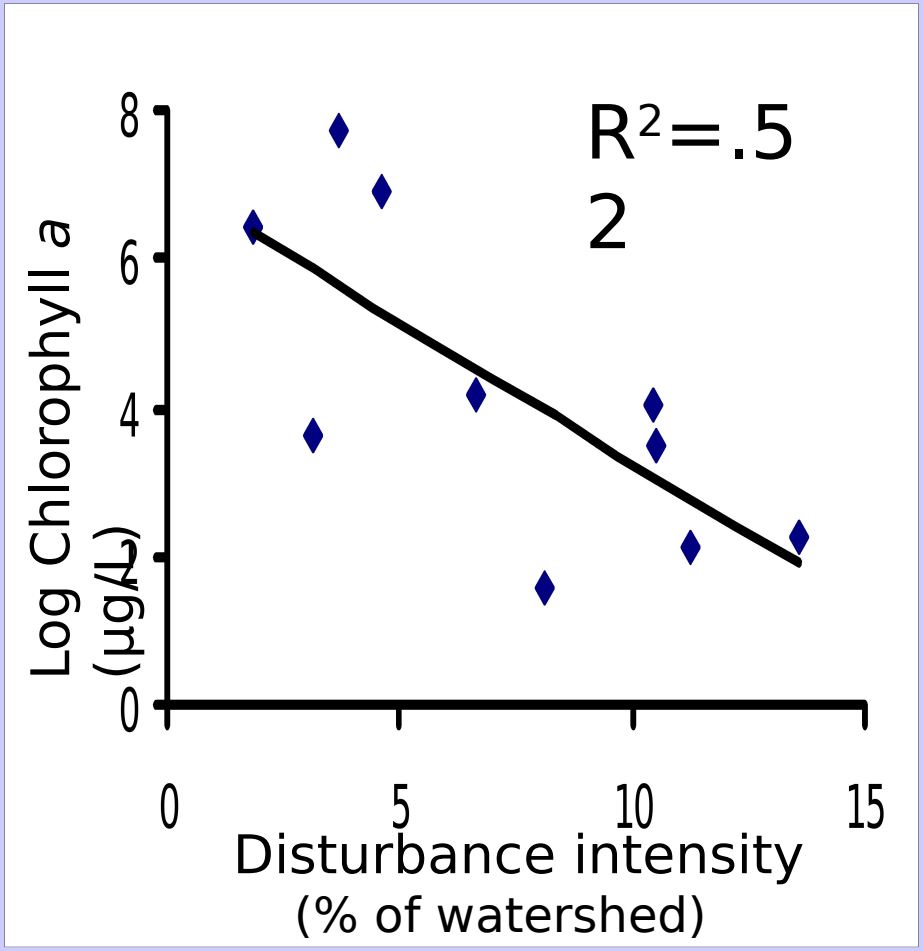


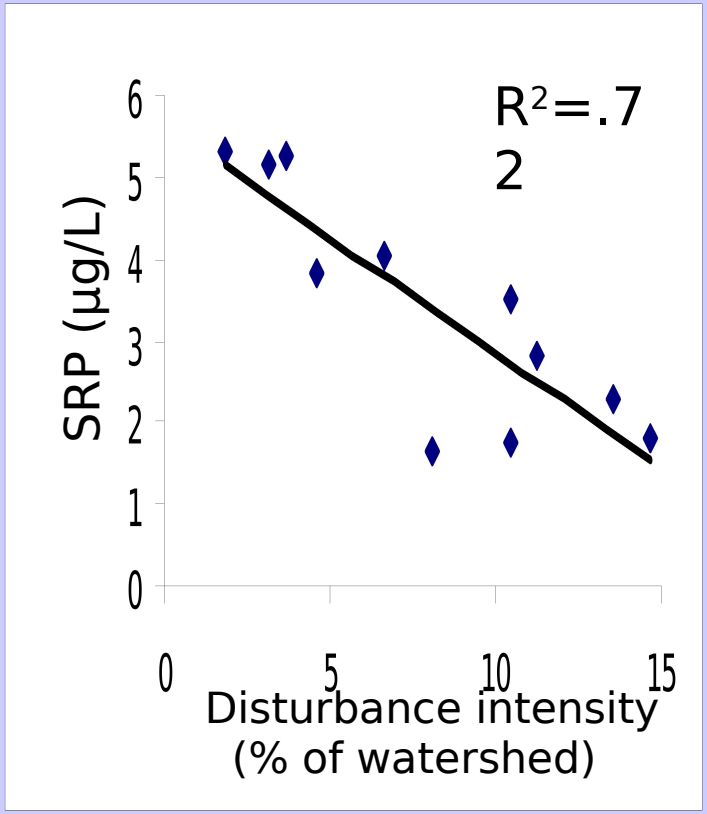
Methods

- Periphyton on sand: inverted petri dish
- Periphyton on wood: scraping coarse woody debris
- Algal biomass (chlorophyll *a*), ratio of attached to unattached algae, diatom size
- Physicochemical parameters

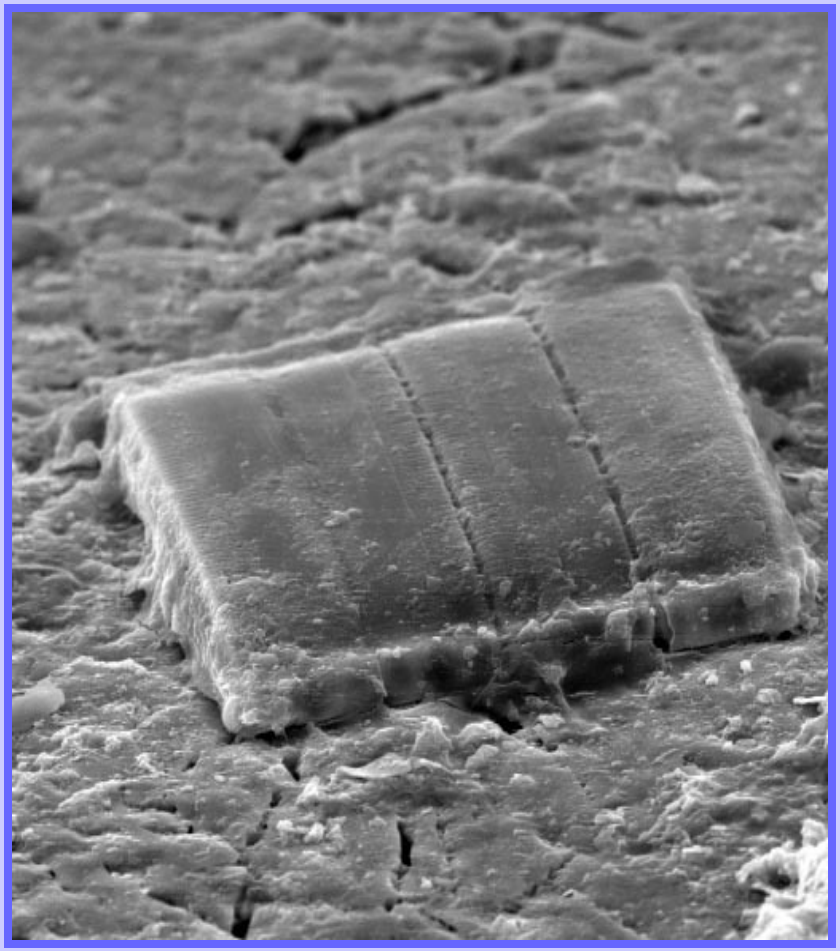
Results:
Algae on sand microhabitat

Algal Biomass

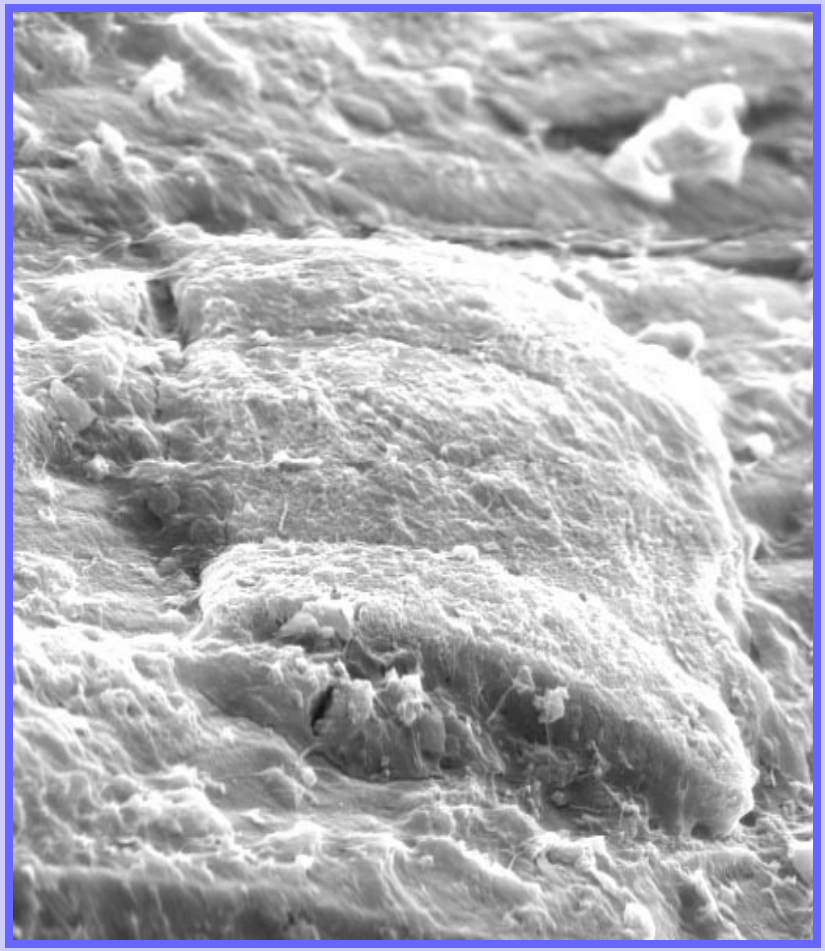




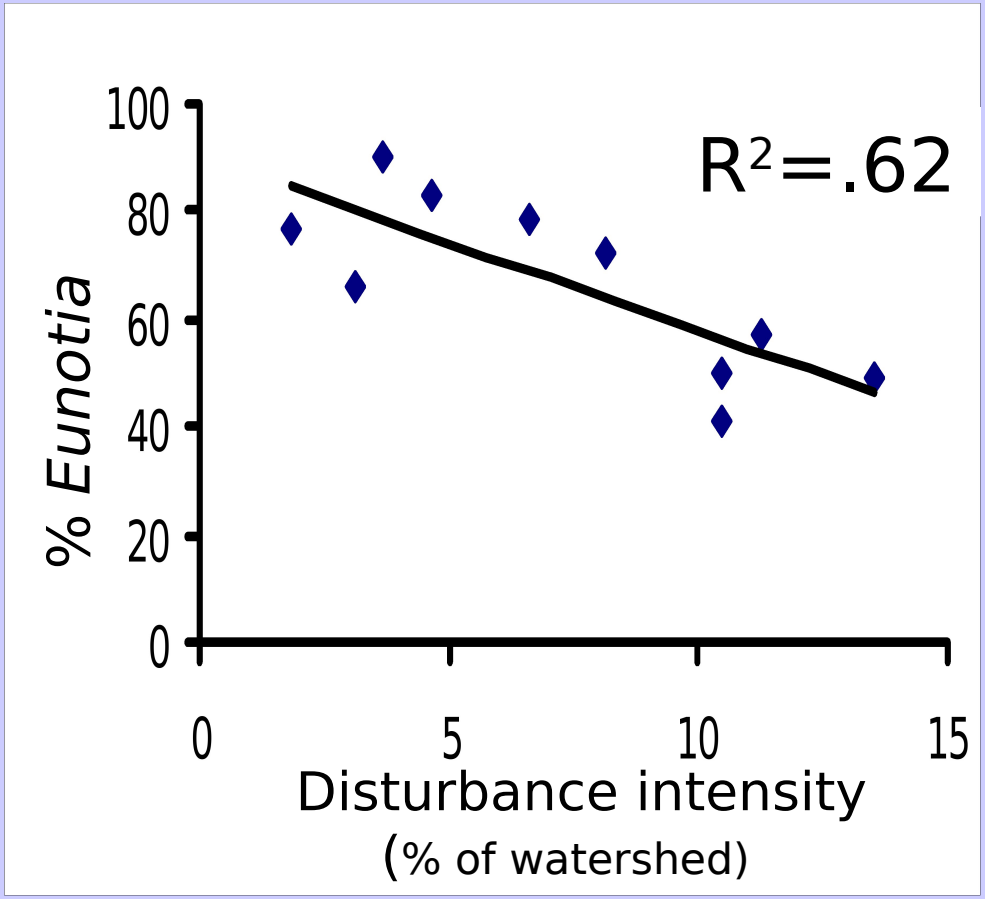
Low-sediment *Eunotia* chain

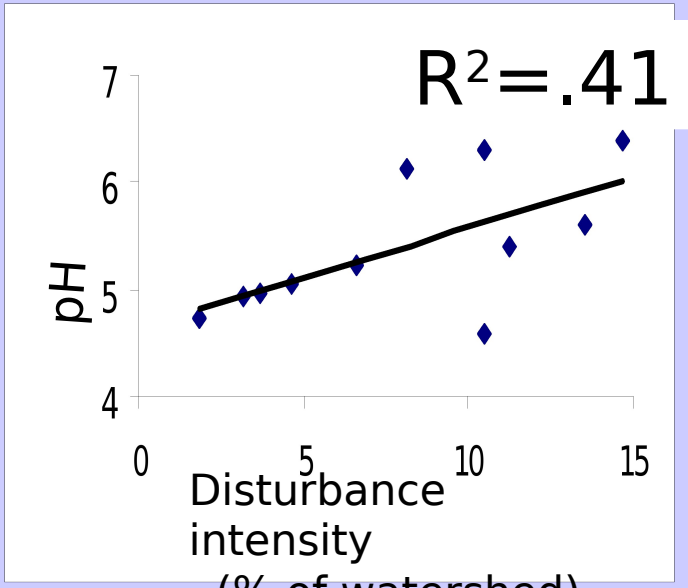


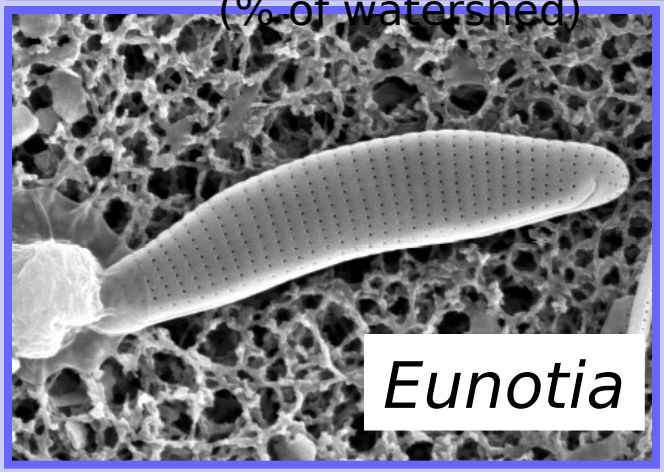
High-sediment *Eunotia* chain



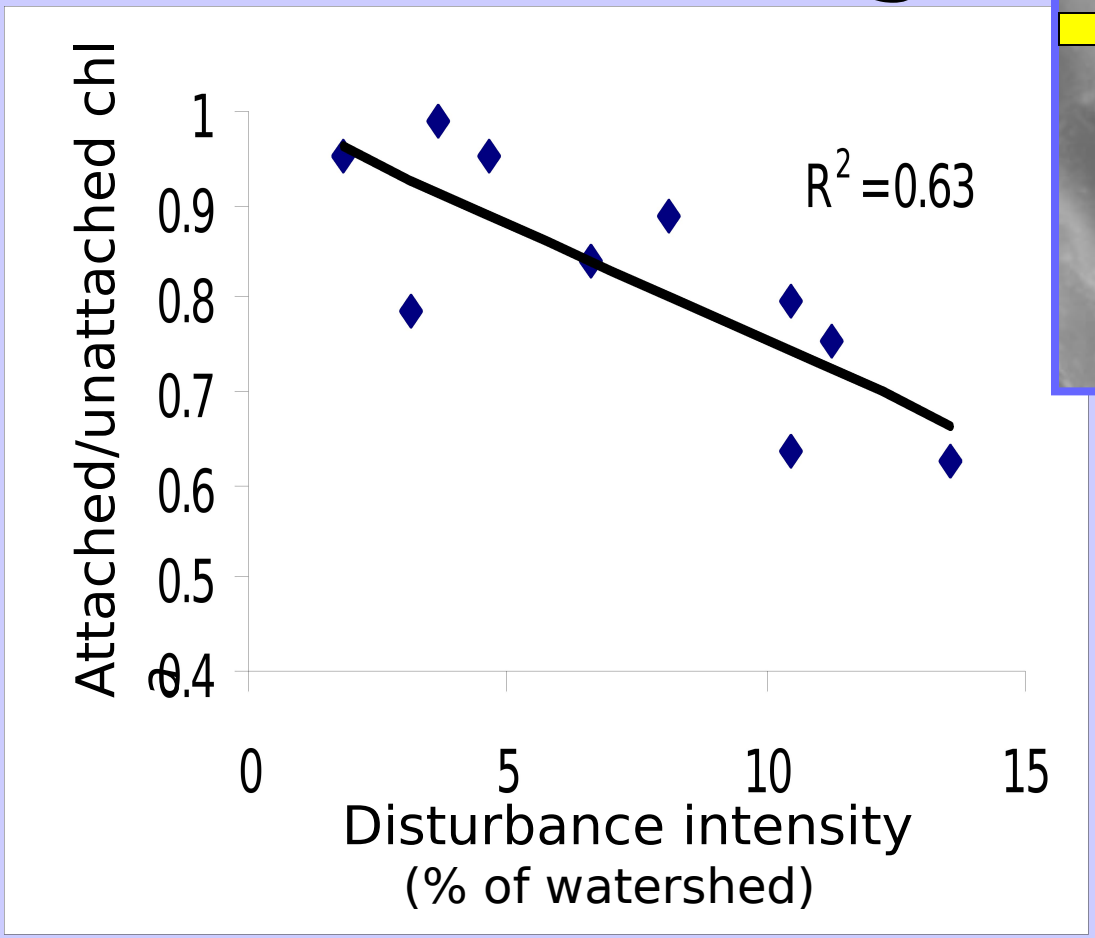
Eunotia abundance



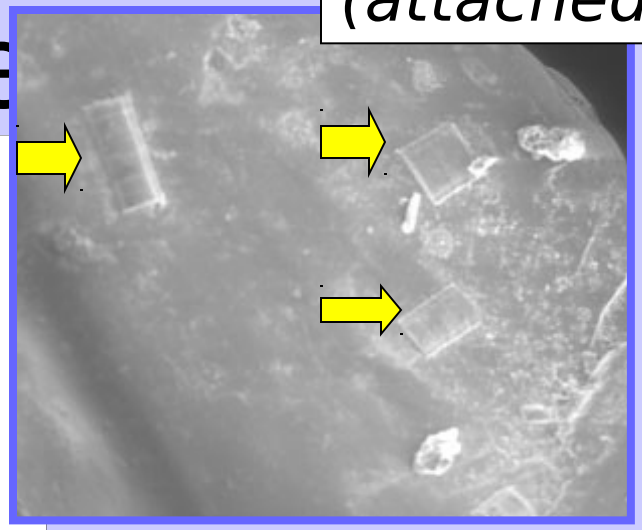




Attached vs. unattached algae



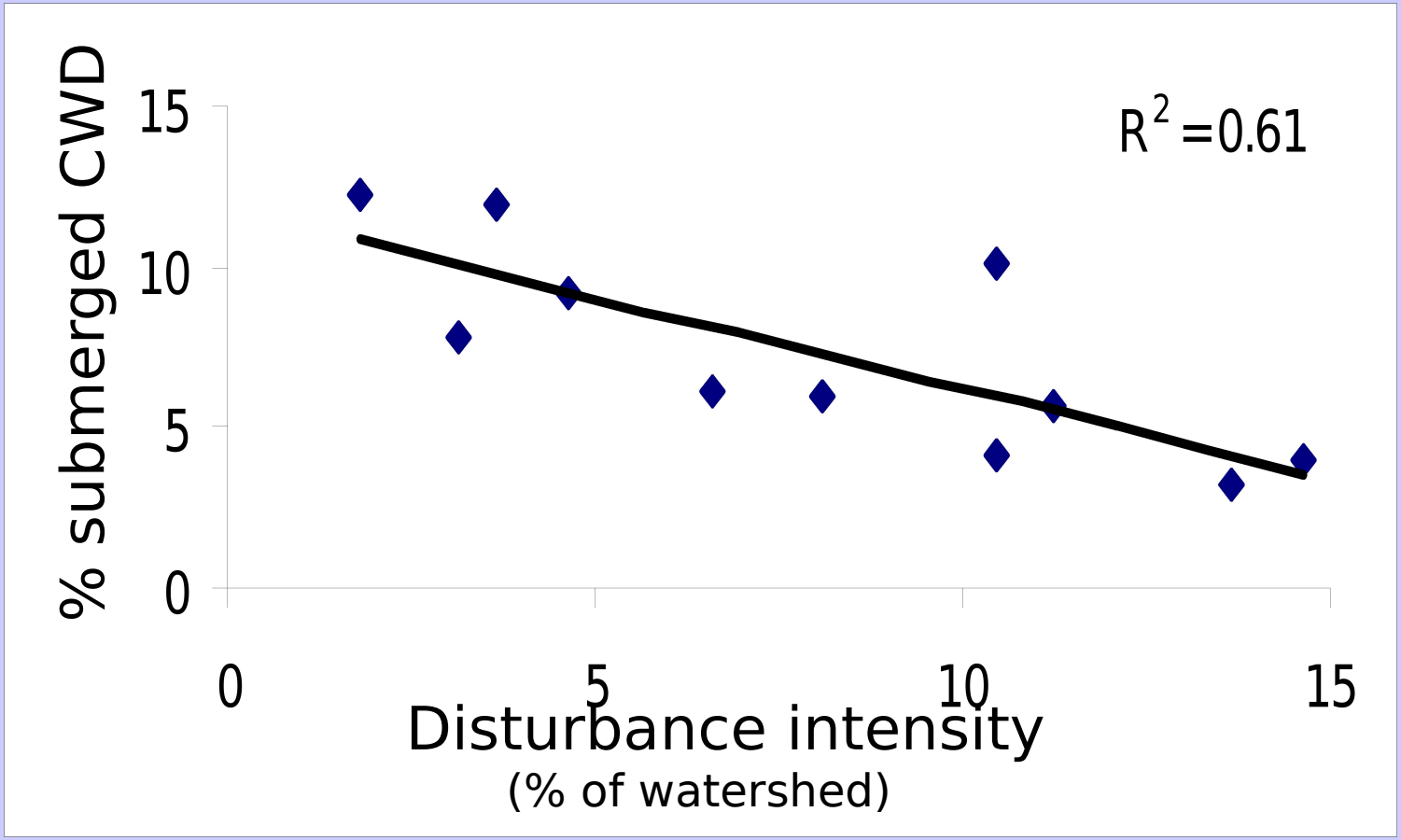
Eunotia (attached)

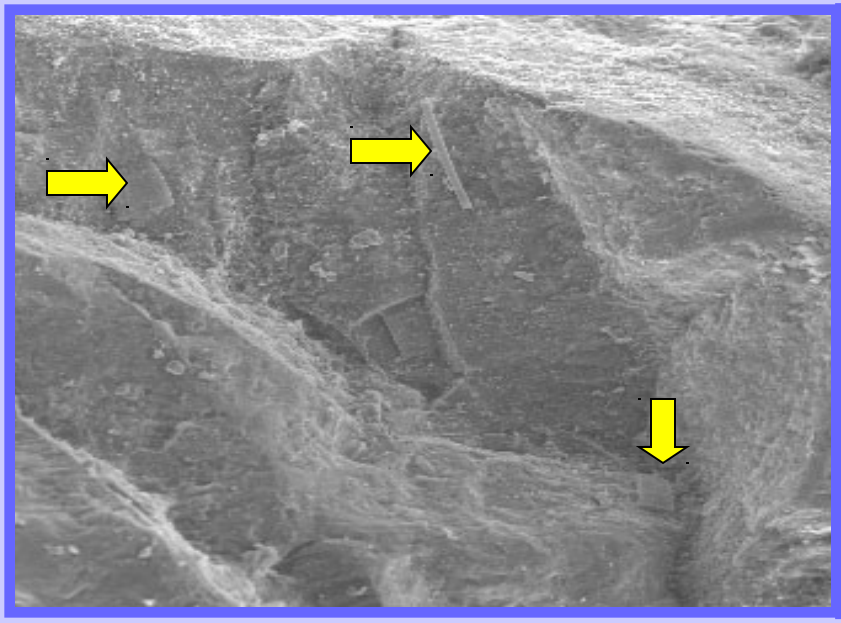


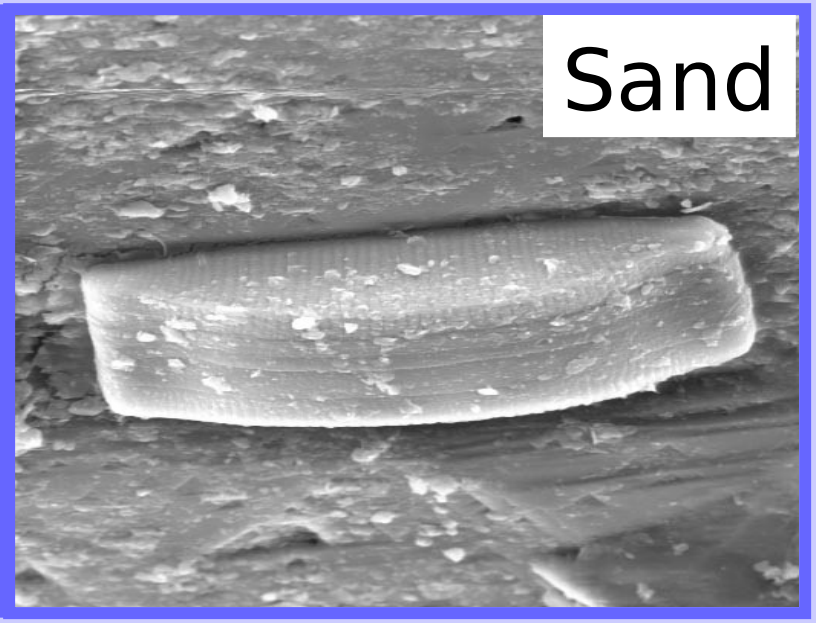
Pinnularia (unattached)

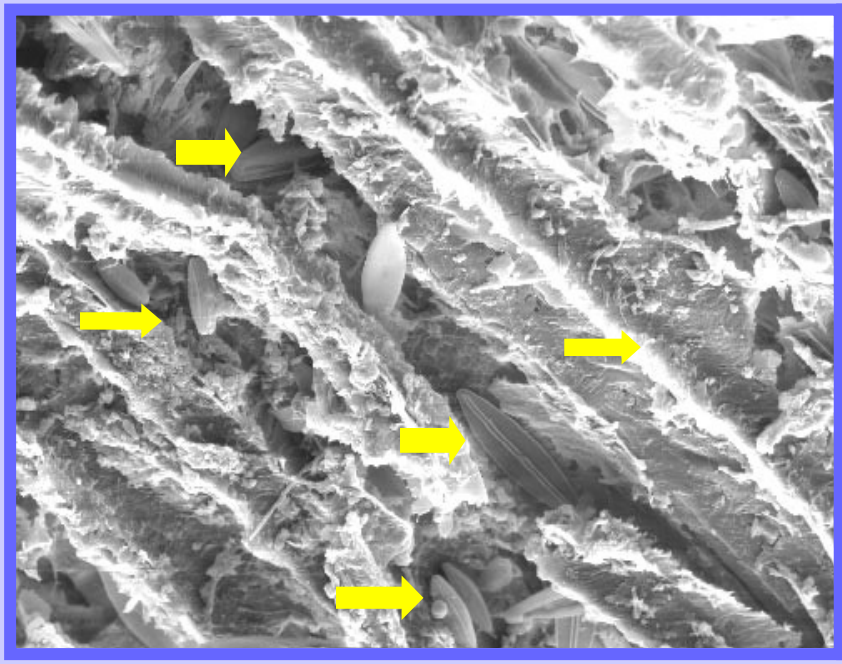
Results:
Algae on wood microhabitat

Coarse Woody Debris Abundance



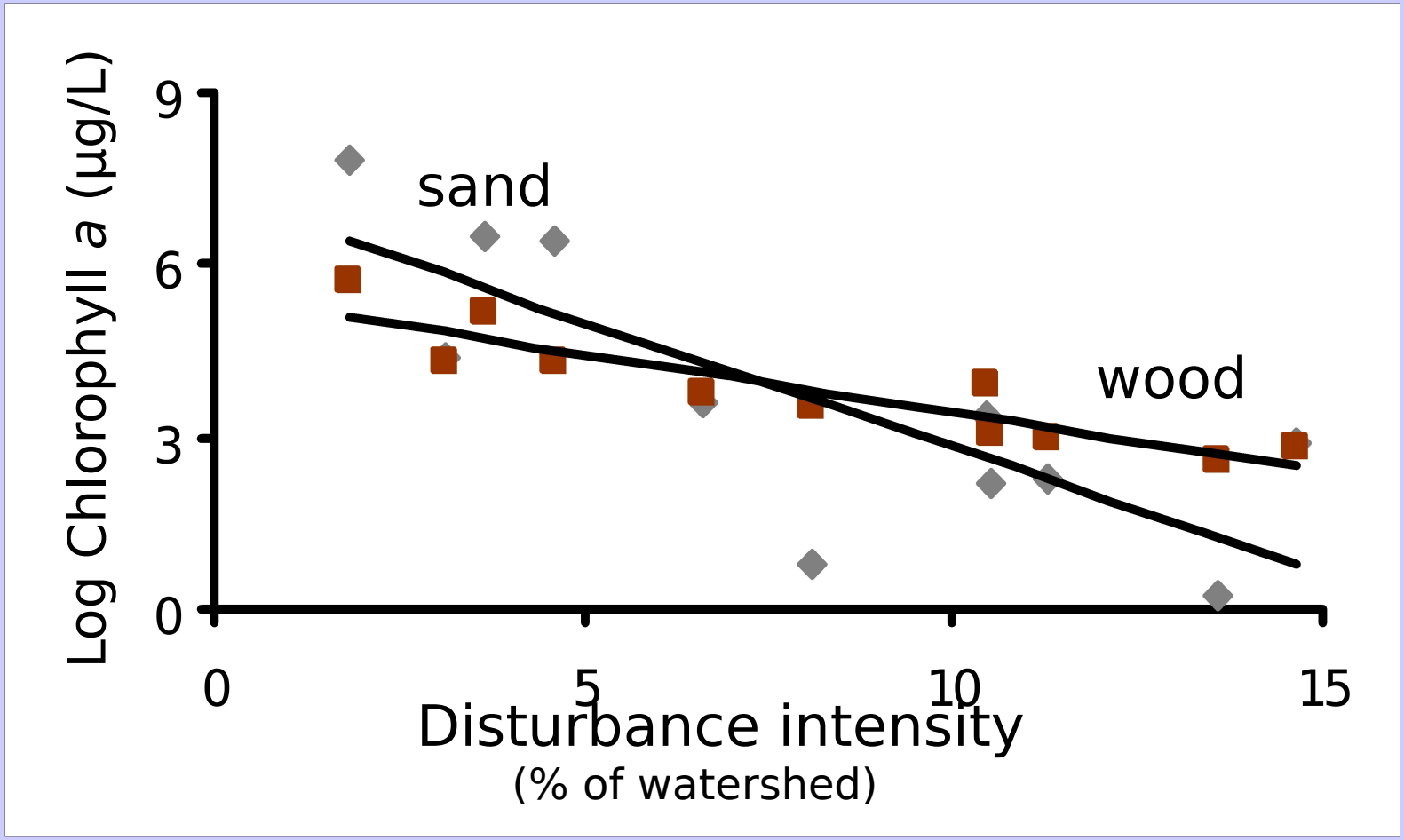



Sand

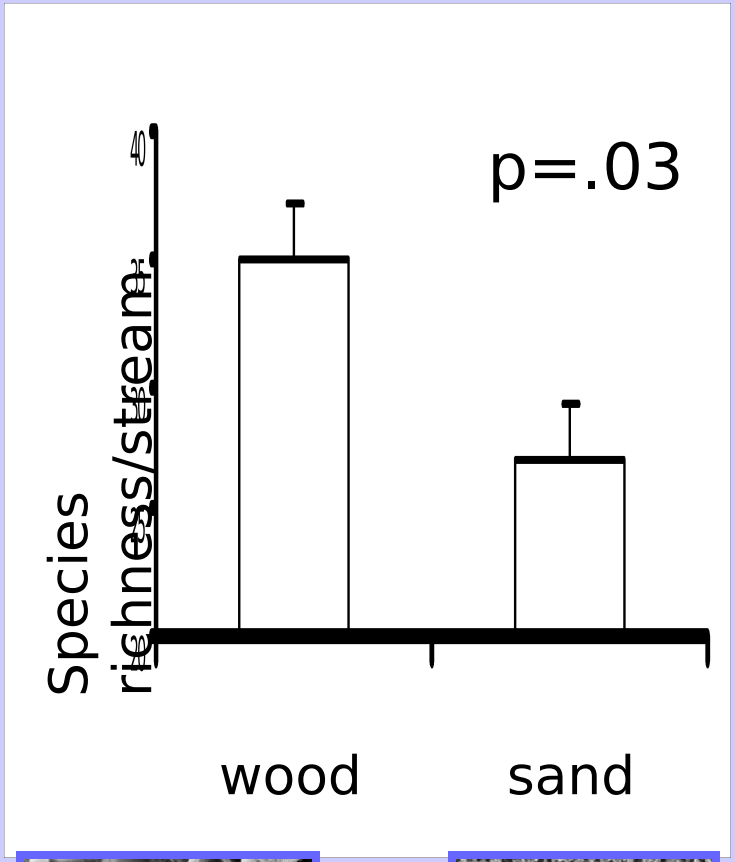


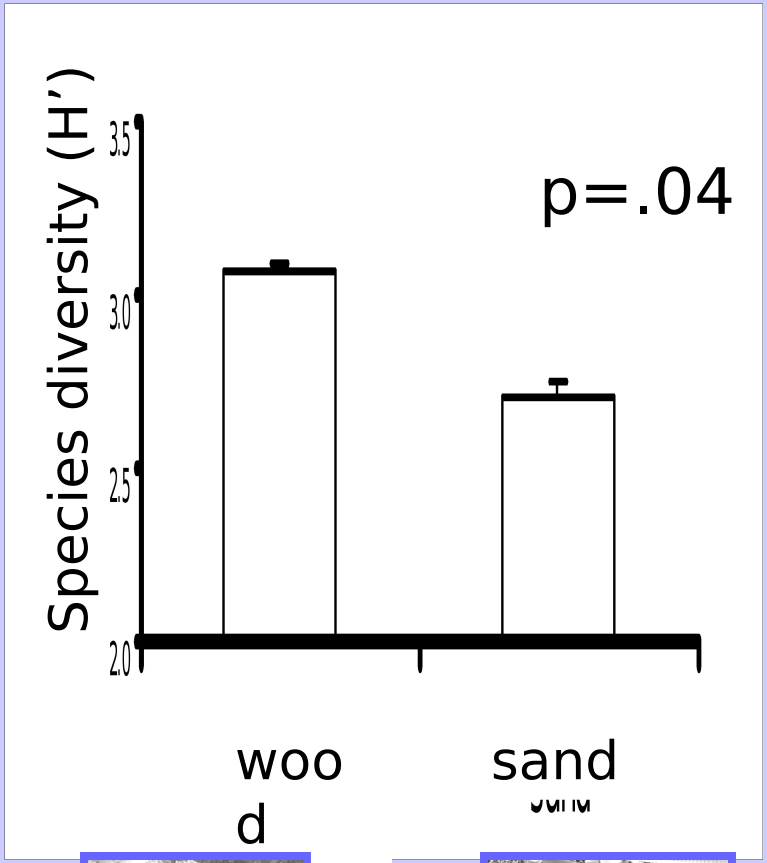
Wood

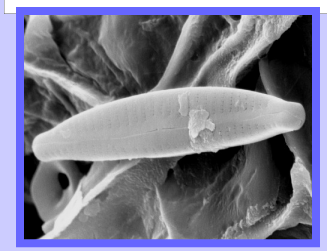
Algal biomass: sand vs. wood

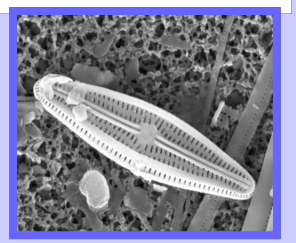


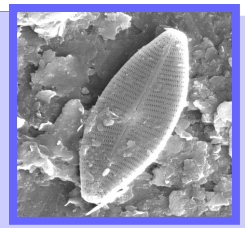
Diversity: sand vs. wood

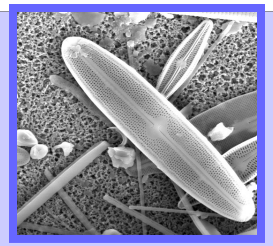




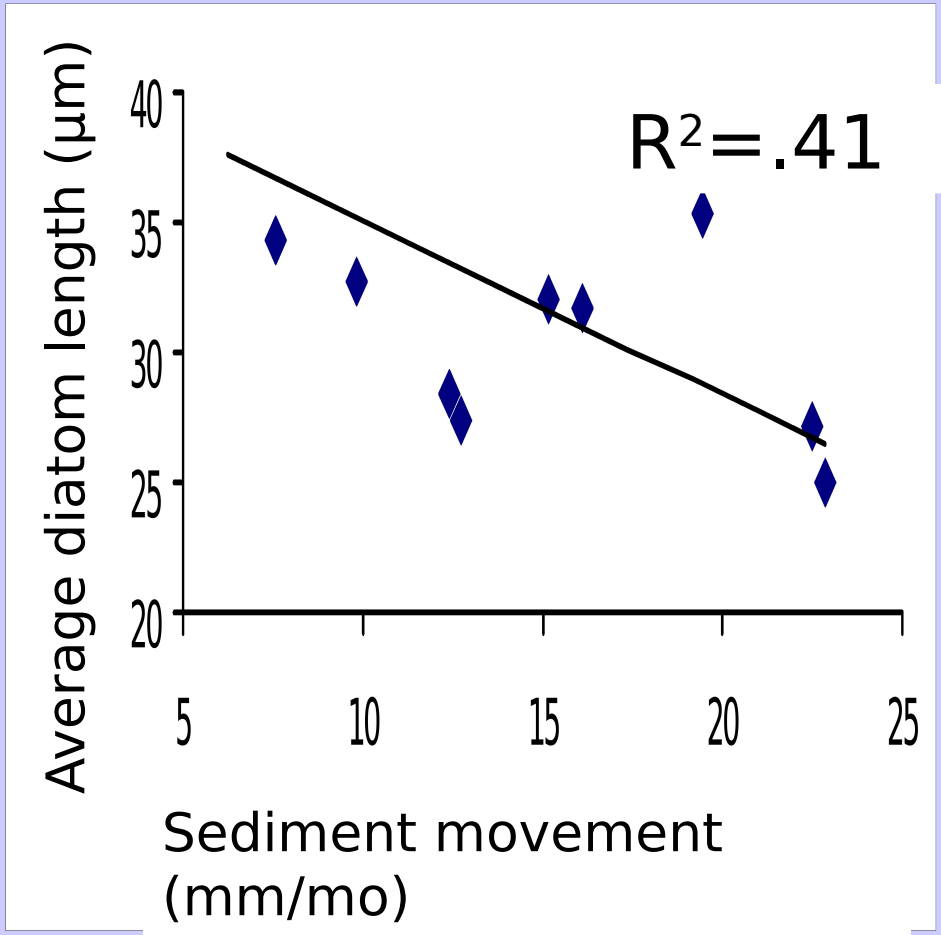


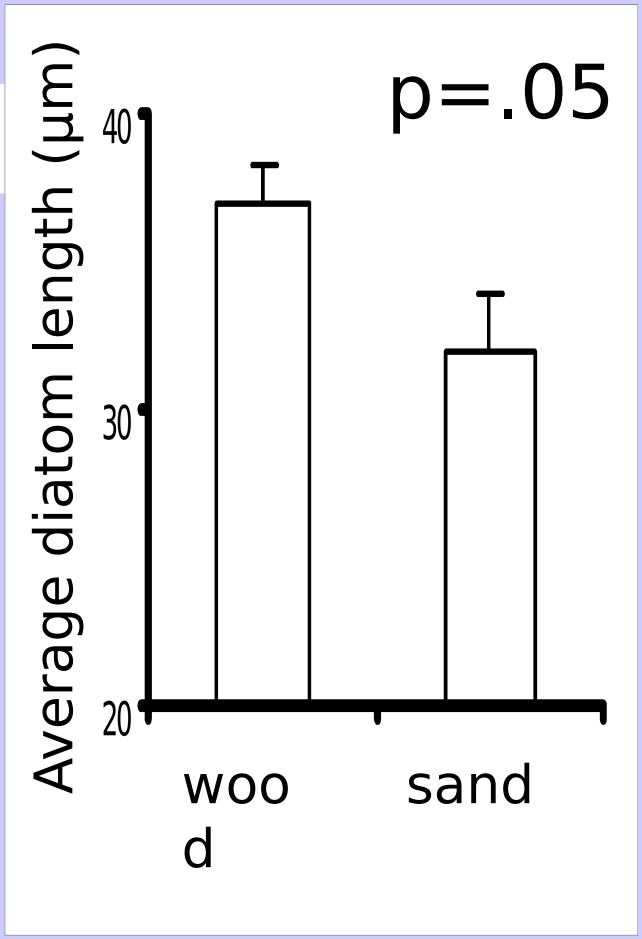




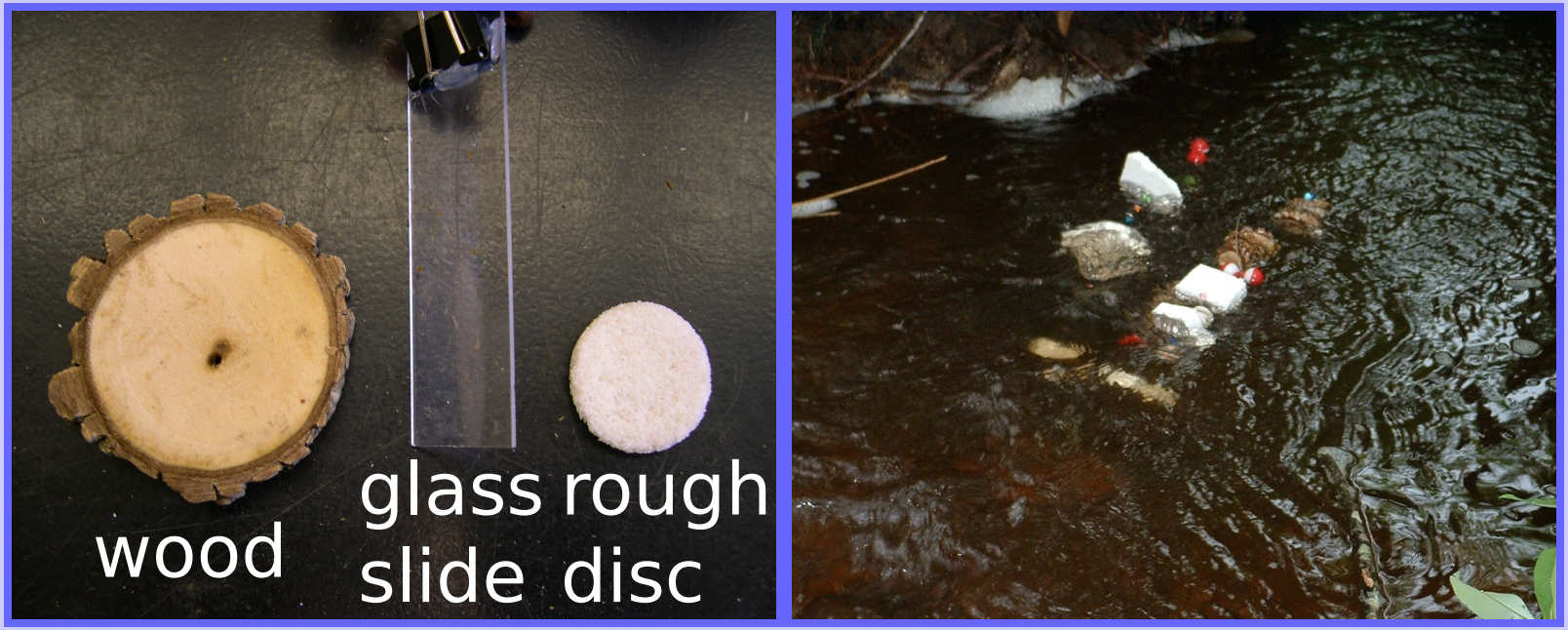


Diatom size


Average diatom length (µm)
40
35
30
25
20
5
10
15
20
25
R²=.41
Sediment movement (mm/mo)

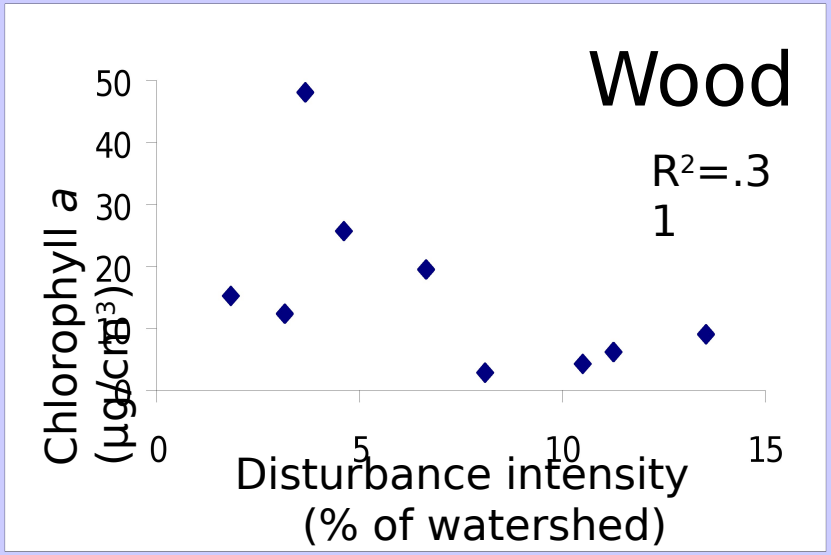

Average diatom length (µm)
40
30
20
p=.05
wood
sand

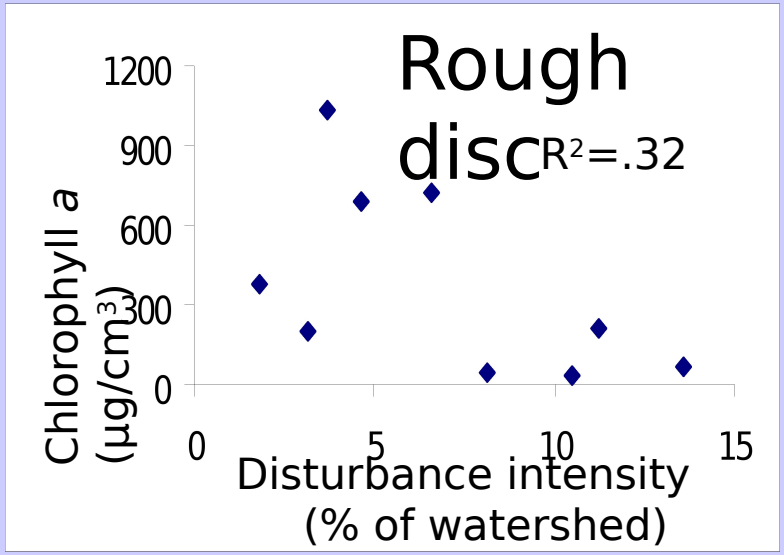
Algal Substrate Experiment

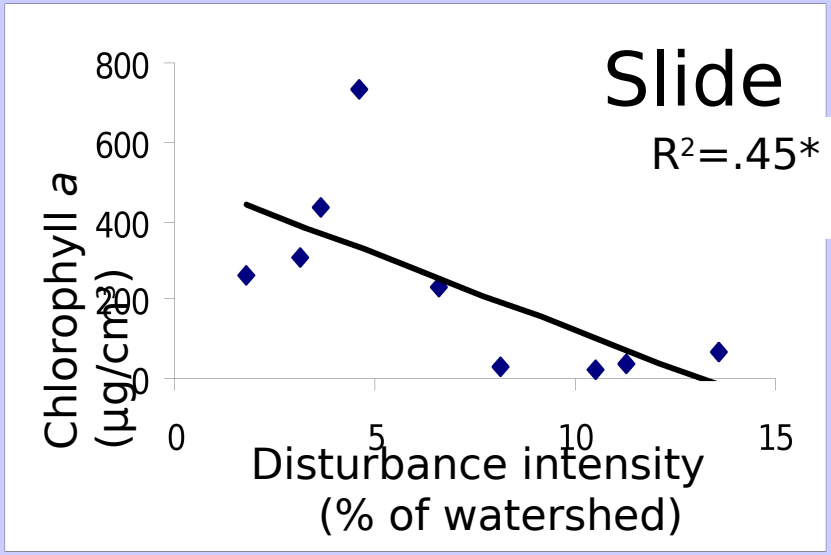


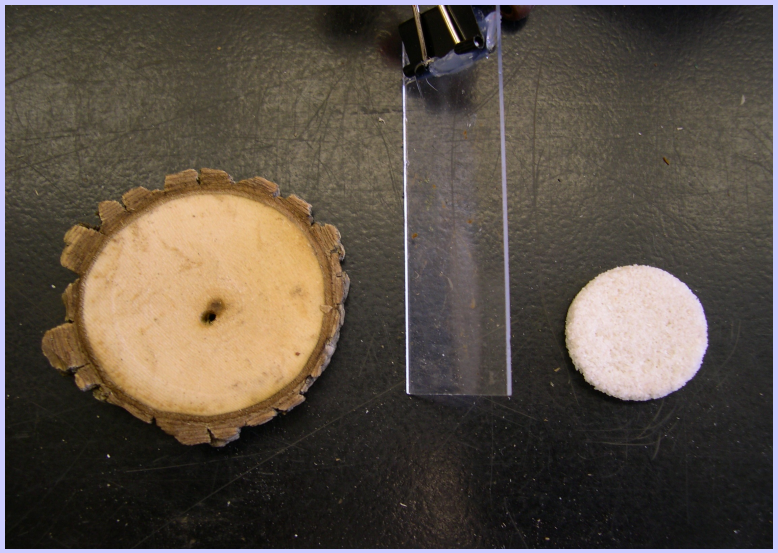
- Measure algal biomass at 5, 10, and 20 weeks

Substrate comparison

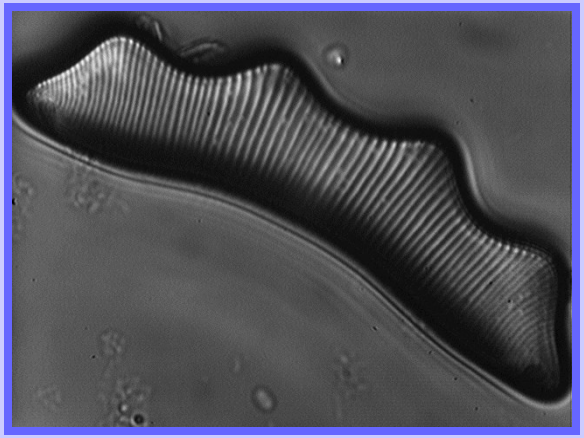








Useful Periphyton Indicators of Disturbance



Decreasing with disturbance:

- Algal biomass (chlorophyll *a*)
- % *Eunotia*
- Ratio of attached to unattached algae
- Diatom size

Future Work

- Restoration of disturbed streams (2003-04):
  - Woody debris additions (perennial streams)
  - Channel revegetation (upland ephemeral streams)
  - Combined upland & perennial restorations
- Evaluate effects of restorations on stream periphyton, benthic invertebrates, physicochemical conditions

Acknowledgements

- DOD, DOE, & EPA Strategic Environmental Research and Development Program (SERDP)
- Hugh Westbury
- Adriene Burnette, Lisa Muellner, and the Auburn Aquatic Ecology Laboratory students